Student Name _____

Teacher Name _____

School _____

System _____

Item Sampler

Tennessee End of Course Assessment
Algebra I Form 4

Reporting Category 4:
Geometry and Measurement

PEARSON

Developed and published under contract with State of Tennessee Department of Education by the Educational Measurement group of Pearson, a business of NCS Pearson, Inc., 2510 North Dodge Street, Iowa City, Iowa 52245.

Algebra I Reference Page

Abbreviations for Geometric Formulas

A = area	d = diameter	r = radius
B = area of base	h = height	s = length of side
b = base	ℓ = length	V = volume
C = circumference	P = perimeter	w = width

Perimeter (P) and Circumference (C)

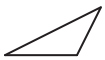
Any Polygon: P = sum of side lengths

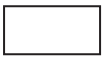
Rectangle: $P = 2\ell + 2w$

Circle: $C = 2\pi r$ or πd

$\pi \approx 3.14$ or $\frac{22}{7}$

Plane Figures — Area (A)

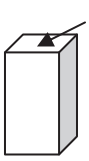
Triangle:  $A = \frac{1}{2}bh$

Rectangle:  $A = \ell w$

Circle:  $A = \pi r^2$

$\pi \approx 3.14$ or $\frac{22}{7}$

Solid Figures — Volume (V)

Right Rectangular Prism: 

$V = Bh$ or $V = \ell wh$

Cube:  $V = s^3$

Algebraic Formulas and Equations

$d = rt$ distance = rate × time

Distance Formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

d = distance between two points

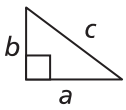
Midpoint Formula: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Standard Form of a Linear Equation: $Ax + By = C$

Slope-Intercept Equation: $y = mx + b$

Point-Slope Equation: $y - y_1 = m(x - x_1)$

Pythagorean Theorem: $a^2 + b^2 = c^2$ 

Quadratics

For $ax^2 + bx + c = 0$: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Discriminant: $b^2 - 4ac$

Measurement Conversions

LENGTH

1 foot (ft) = 12 inches (in.)
1 yard (yd) = 3 feet
1 yard = 36 inches
1 mile = 1,760 yards
1 mile = 5,280 feet

CAPACITY

1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 quart = 4 cups
1 gallon (gal) = 4 quarts

WEIGHT

1 pound (lb) = 16 ounces (oz)
1 ton (T) = 2,000 pounds

CONVERSION BETWEEN CUSTOMARY AND METRIC MEASUREMENT

1 yard = 0.9144 m
1 foot = 0.3048 m
1 inch = 2.54 cm
1 quart = 0.946 L
1 ounce = 28.35 g
1 lb = 0.45 kg

Contents

Introduction to Algebra I

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment*, a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or at the end of the school year.

This test contains 65 multiple-choice questions.

You will have ample time to read and answer each of the questions. The Algebra I test has been designed to be administered in one session and is not timed. The first 15 minutes are set aside to complete identifying data on the answer sheet.

Calculator use is optional. Sharing calculators during testing is not permitted.

The following types of calculators/devices may **NOT** be used during the test:

- pocket organizers
- electronic writing pads or input devices
- Some examples of prohibited calculators are:
    - Casio models: CFX-9970G, Algebra FX 2.0
    - Hewlett-Packard models: HP-40G, HP-49G
    - Texas Instruments models: TI-89, TI-92, Voyage 200, TI-NSPIRE – the CAS version (The non-CAS version of TI-NSPIRE is allowable.)
- calculators that can communicate (transfer data or information) wirelessly with other student calculators/devices
- cell phones, PSPs, and/or iPods
- Students may use any four-function, scientific, or graphing calculator does not have any of the above features. The use of units that have a Computer Algebra System (CAS) is NOT allowed.

Tips for Taking the Test

Preparing for the test

- Review this Tennessee End of Course Item Sampler for Algebra I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Algebra I, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in this Practice Test.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Algebra I provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Algebra I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

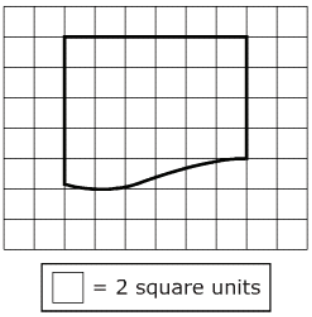
An Answer Key is located in Page 20. Use it to check your answers. Review items that you get wrong.

Reporting Category: Geometry and Measurement

Numbers 1 through 21

Performance Indicator: 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.

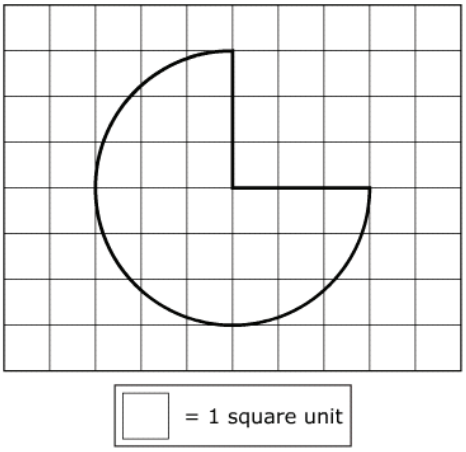
1. **Estimate the area of the figure below.**



- **A** 28 square units
- **B** 30 square units
- **C** 56 square units
- **D** 64 square units

Performance Indicator: 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.

2. **Which is the <u>best</u> estimate for the area of the figure?**

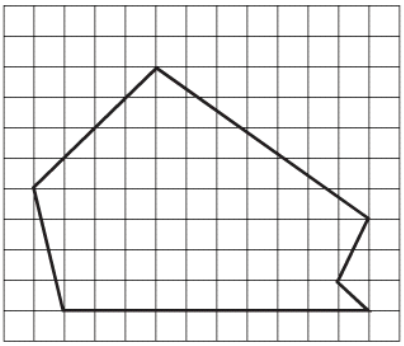


- **A** 15 square units
- **B** 21 square units
- **C** 24 square units
- **D** 27 square units

Go On ▶

Performance Indicator: 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.

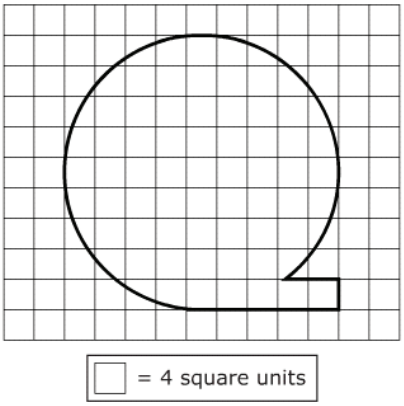
3. **Which is the <u>best</u> estimate for the area of the shape shown below?**



- **A** 45 square units
- **B** 49 square units
- **C** 57 square units
- **D** 69 square units

Performance Indicator: 3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.

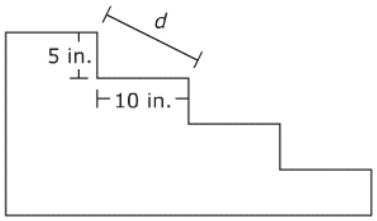
4. **Which is the <u>best</u> estimate for the area of the shape shown below?**



- **A** 66 square units
- **B** 68 square units
- **C** 268 square units
- **D** 300 square units

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

5. **The diagram below shows the dimensions of a staircase in a building. These dimensions apply to each of the steps.**

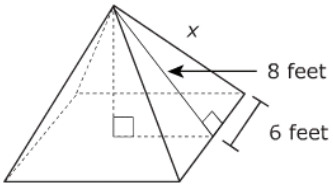


To the nearest tenth of an inch, what is the distance, *d*, between the edges of each step?

- **A** 15.0
- **B** 11.2
- **C** 8.7
- **D** 5.0

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

6. **The roof of a clock tower is shaped like a square pyramid as shown below. There are four rafter beams, each identical to the beam labeled *x*.**



(Not drawn to scale)

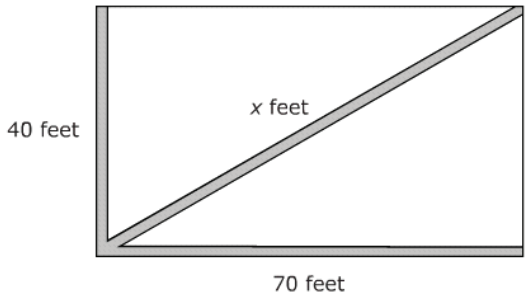
What is the length of each rafter beam?

- **A** 5 feet
- **B** 9 feet
- **C** 10 feet
- **D** 14 feet

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

7.

Mr. Bowen has a rectangular yard. He is installing 3 lengths of pipe for sprinklers in his yard: 40 feet, 70 feet, and *x* feet.



To the nearest foot, how many total feet of pipe will Mr. Bowen need for the sprinklers?

- **A** 110 feet
- **B** 120 feet
- **C** 167 feet
- **D** 191 feet

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

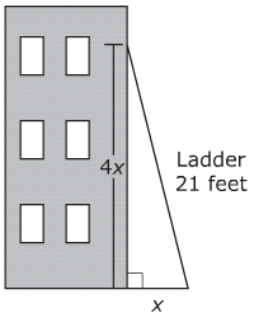
8.

The length of the diagonal of a picture frame is 30 inches. The height of the frame is 18 inches. What is the width of the frame?

- **A** 7 inches
- **B** 12 inches
- **C** 24 inches
- **D** 35 inches

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

9. **A ladder is placed *x* feet from the base of a building and it reaches 4*x* feet up the side of the building. The ladder is 21 feet long.**

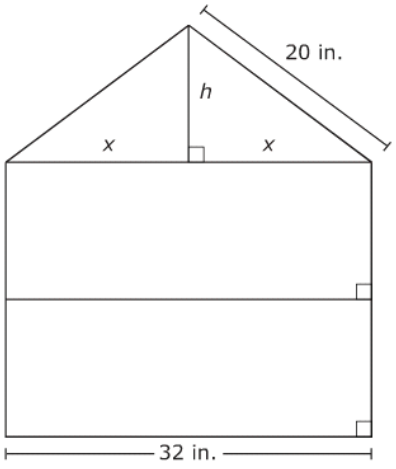


To the nearest foot, what is the maximum height on the wall that the ladder can reach?

- **A** 36 feet
- **B** 20 feet
- **C** 17 feet
- **D** 5 feet

Performance Indicator: 3102.4.2 Solve contextual problems using the Pythagorean Theorem.

10. **Mr. Williams built a dollhouse as shown below.**



If the house is 32 inches wide and the slant height of the roof is 20 inches, what is the height, *h*, of the roof?

- **A** 4 inches
- **B** 6 inches
- **C** 12 inches
- **D** 26 inches

Go On ▶

Performance Indicator: 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

11.

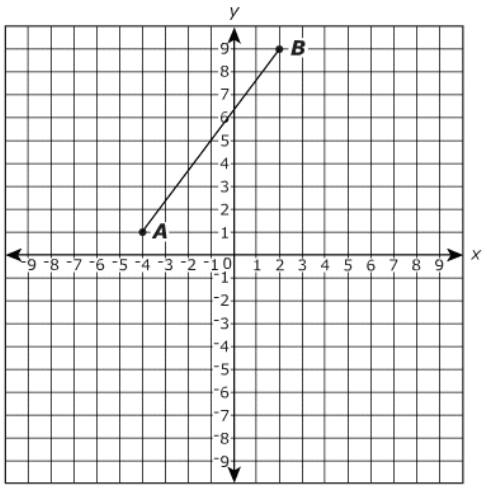
What are the coordinates of the midpoint of a line segment with endpoints (−2, −3) and $\left(1, \frac{1}{2}\right)$?

- **A** $\left(-1, -2\frac{1}{2}\right)$
- **B** $\left(-\frac{1}{2}, -2\frac{1}{2}\right)$
- **C** $\left(-1, -1\frac{1}{4}\right)$
- **D** $\left(-\frac{1}{2}, -1\frac{1}{4}\right)$

Performance Indicator: 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

12.

Maria draws horizontal line segment $\overline{AC}$ such that $AB = AC$.



Which coordinates could be Point *C* ?

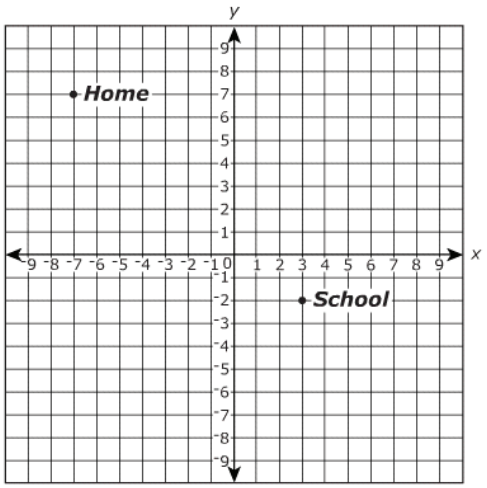
- **A** (−4, 11)
- **B** (−8, 9)
- **C** (6, 1)
- **D** (14, 1)

Go On ▶

Performance Indicator: 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

13.

The graph shows the position of Oliver's home and that of his school.



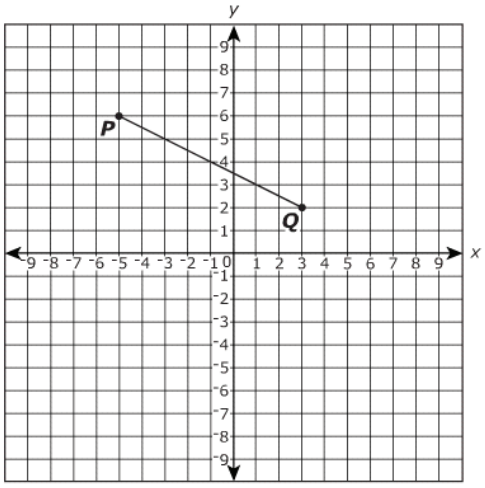
The library is located at the midpoint of the line between Oliver's home and his school. At what coordinates is the library located on the graph?

- **A** $\left(-2, 2\frac{1}{2}\right)$
- **B** $(-2, 5)$
- **C** $\left(-4, 2\frac{1}{2}\right)$
- **D** $\left(2, -2\frac{1}{2}\right)$

Performance Indicator: 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

14.

What is the length of line segment $\overline{PQ}$?

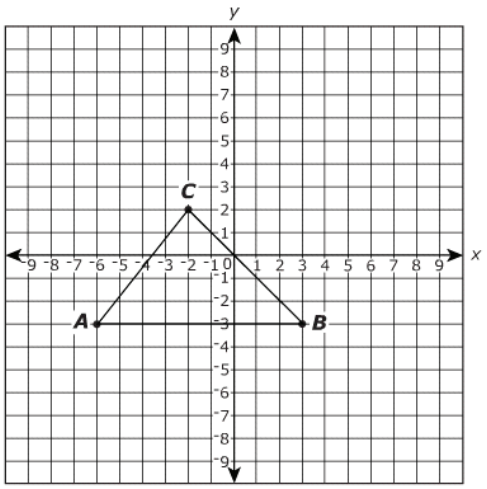


- **A** $2\sqrt{35}$
- **B** $2\sqrt{34}$
- **C** $4\sqrt{5}$
- **D** $4\sqrt{3}$

Go On ▶

Performance Indicator: 3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

15. **Triangle *ABC* is graphed below.**



What are the coordinates of the midpoint of side $\overline{BC}$?

- **A** $(1, -1)$
- **B** $(-1, 1)$
- **C** $\left(-\frac{1}{2}, \frac{1}{2}\right)$
- **D** $\left(\frac{1}{2}, -\frac{1}{2}\right)$

Performance Indicator: 3102.4.4 Convert rates and measurements.

16. **A geological survey report states that a person uses on average 62 gallons of water per day. If 1 gallon = 3.78 liters, which is closest to the average amount of water used in liters per hour?**

- **A** 2.58 liters per hour
- **B** 9.77 liters per hour
- **C** 12 liters per hour
- **D** 20 liters per hour

Go On ▶

Performance Indicator: 3102.4.4 Convert rates and measurements.

17. **Fred walks at a speed of 3.1 miles per hour. What is Fred's speed, in feet per second, rounded to the hundredths place?**

- **A** 0.05
- **B** 1.47
- **C** 3.75
- **D** 4.55

Performance Indicator: 3102.4.4 Convert rates and measurements.

18. **A 32-ounce bottle of energy drink costs $9.00. What is the cost per gallon?**

- **A** $0.28
- **B** $2.25
- **C** $36.00
- **D** $45.00

Performance Indicator: 3102.4.4 Convert rates and measurements.

19. **Darlene is painting her room. She paints 54 square feet in one hour. At that rate, how many square yards per minute can Darlene paint?**

- **A** 0.1
- **B** 0.3
- **C** 6
- **D** 18

Performance Indicator: 3102.4.4 Convert rates and measurements.

20. **Which number belongs in the blank?**

15 square yards = ____ square feet

- **A** 5
- **B** 45
- **C** 90
- **D** 135

Performance Indicator: 3102.4.4 Convert rates and measurements.

21. **A can holds 4 quarts of fruit juice. To the nearest thousandth of a liter, how many liters is 4 quarts?**

- **A** 3.664 liters
- **B** 3.784 liters
- **C** 4.000 liters
- **D** 4.228 liters

Reporting Category 4: Geometry and Measurement		
Item Number	**Correct Answer**	**Performance Indicator**
1	C	3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.
2	B	3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.
3	C	3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.
4	C	3102.4.1 Develop and apply strategies to estimate the area of any shape on a plane grid.
5	B	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
6	C	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
7	D	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
8	C	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
9	B	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
10	C	3102.4.2 Solve contextual problems using the Pythagorean Theorem.
11	D	3102.4.3 Solve problems involving the distance between points or midpoint of a segment.
12	C	3102.4.3 Solve problems involving the distance between points or midpoint of a segment.
13	A	3102.4.3 Solve problems involving the distance between points or midpoint of a segment.
14	C	3102.4.3 Solve problems involving the distance between points or midpoint of a segment.
15	D	3102.4.3 Solve problems involving the distance between points or midpoint of a segment.

16	B	3102.4.4 Convert rates and measurements.
17	D	3102.4.4 Convert rates and measurements.
18	C	3102.4.4 Convert rates and measurements.
19	A	3102.4.4 Convert rates and measurements.
20	D	3102.4.4 Convert rates and measurements.
21	B	3102.4.4 Convert rates and measurements.